



US005976186A

United States Patent [19]

Bao et al.

[11] Patent Number: 5,976,186

[45] Date of Patent: *Nov. 2, 1999

[54] **HYDROGEL INTERVERTEBRAL DISC NUCLEUS**

[75] Inventors: Qi-Bin Bao, Livingston; Paul A. Higham, Ringwood, both of N.J.

[73] Assignee: Stryker Technologies Corporation, Kalamazoo, Mich.

[*] Notice: This patent issued on a continued prosecution application filed under 37 CFR 1.53(d), and is subject to the twenty year patent term provisions of 35 U.S.C. 154(a)(2).

[21] Appl. No.: 08/670,140

[22] Filed: Jun. 25, 1996

Related U.S. Application Data

[63] Continuation of application No. 08/303,297, Sep. 8, 1994, abandoned.

[51] Int. Cl.⁶ A61F 2/44

[52] U.S. Cl. 623/17; 623/16; 623/18; 623/20

[58] Field of Search 623/16, 17, 18, 623/20, 21

[56] **References Cited****U.S. PATENT DOCUMENTS**

3,607,848	9/1971	Stoy et al.	623/66
3,867,728	2/1975	Stubstad et al.	623/17
3,875,595	4/1975	Froning	623/17
4,309,777	1/1982	Patil	3/1.91
4,331,783	5/1982	Stoy	525/294
4,337,327	6/1982	Stoy	525/280
4,349,921	9/1982	Kunz	3/1
4,369,294	1/1983	Stoy	525/340
4,370,451	1/1983	Stoy	525/294
4,379,874	4/1983	Stoy	524/27
4,420,589	12/1983	Stoy	525/93
4,631,188	12/1986	Stoy et al.	424/81
4,663,358	5/1987	Ilyon et al.	521/64
4,714,469	12/1987	Kenna	623/17
4,772,287	9/1988	Ray et al.	623/17

4,863,477	9/1989	Monson	
4,904,260	2/1990	Ray et al.	623/17
4,911,718	3/1990	Lee et al.	623/17
5,047,055	9/1991	Bao et al.	623/17
5,171,280	12/1992	Baumgartner	623/17
5,192,326	3/1993	Bao et al.	623/17
5,314,478	5/1994	Oka et al.	623/18
5,458,643	10/1995	Oka et al.	623/17
5,534,028	7/1996	Bao et al.	623/17
5,578,086	11/1996	Prescott	623/16
5,645,592	7/1997	Nicolaia et al.	623/16
5,855,619	1/1999	Caplan et al.	623/16

FOREIGN PATENT DOCUMENTS

0 356 112	2/1990	European Pat. Off.	
0453393	3/1991	European Pat. Off.	
0 505 634	9/1992	European Pat. Off.	
WO-A			
9210982	7/1992	WIPO	
9423671	10/1994	WIPO	623/17

Primary Examiner—Paul B. Prebille

Attorney, Agent, or Firm—Lerner, David, Littenberg, Krumholz & Mentlik, LLP

[57] **ABSTRACT**

An article for use in the preparation of a hydrogel prosthetic nucleus, for an intervertebral disc, having equilibrium water contents (EWCs) of from about 30 to about 90% and compressive strengths of at least 4 meganewtons per square meter (MNm⁻²), at their EWCs, when subjected to the same constraints as the normal nucleus, comprising one or more xerogel rods containing from zero to less than the EWC. A method for preparing a hydrogel prosthetic nucleus, for a vertebral disc, comprising one or more hydrogel rods containing from about 30 to about 90% water, and having compressive strengths of at least 1 MNm⁻², at their EWCs, which comprises inserting one or more hydrophilic xerogel rods, which at their EWC will contain from about 30 to about 90% water and have compressive strengths of at least 1 MNm⁻², containing water in an amount from about zero to less than their EWC, into the cavity of the disc through an opening in its annulus and allowing the rod, or rods, to absorb sufficient water from the body fluids to attain their EWCs and essentially fill the intervertebral nuclear disc cavity.

19 Claims, 2 Drawing Sheets

